ABSTRACT OF THE DISCLOSURE

This invention uses a real-time holographic medium to record the amplitude and phase information collected from a moving platform at the aperture plane of a side-looking optical sensor over the collection time. A back-scan mirror is used to compensate platform motion during the synthetic aperture integration time. Phase errors caused by a nonlinear platform motion are compensated by controlling the phase offset between the illumination beam and the reference beam used to write the hologram based on inertial measurements of the flight path and the sensor line-of-sight pointing angles. In the illustrative embodiment, a synthetic aperture ladar (SAL) imaging system is mounted on a mobile platform. The system is adapted to receive a beam of electromagnetic energy; record the intensity and phase pattern carried by the beam; and store the pattern to compensate for motion of the platform relative to an external reference. In the illustrative embodiment, the image is stored as a holographic image. The system includes a back-scan mirror, which compensates the stored holographic pattern for motion of the platform. The medium and back-scan mirror may be replaced with a digital camera and one-dimensional and two-dimensional arrays may be used. In a specific embodiment, a two-dimensional array is used with a time delay and integration (TDI) scheme, which compensates for motion of the platform in the storage of the optical signals. In an alternative embodiment, a back-scanning mirror is used to compensate for motion of the platform. Consequently, the interference pattern between a relayed image of the aperture plane and a reference beam is continuously stored. In this embodiment, the instantaneous location of the received beam on the recording medium is controlled to compensate for motion of the platform.